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IDENTIFICATION OF THE DESERT MOUSE, *PSEUDOMYS DESERTOR* AND THE WESTERN CHESTNUT MOUSE, *PSEUDOMYS NANUS*

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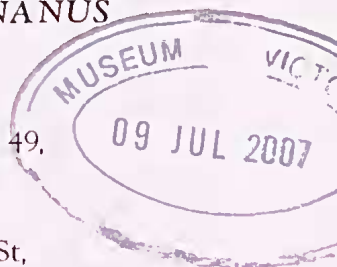
ABSTRACT

The Desert Mouse, *Pseudomys desertor* and the Western Chestnut Mouse, *P. nanus* have a very similar external appearance. Both can be distinguished, when adult, by the position of the nipples in the female, by the shape of the head, and by overall body size. The two species are sympatric in part of their range.

INTRODUCTION

The Desert Mouse, *Pseudomys desertor* and the Western Chestnut Mouse, *P. nanus* are small native Australian rodents

which are very similar in appearance and may be difficult to distinguish in the hand. Mature adults of *P. desertor* are generally smaller than those of *P.*



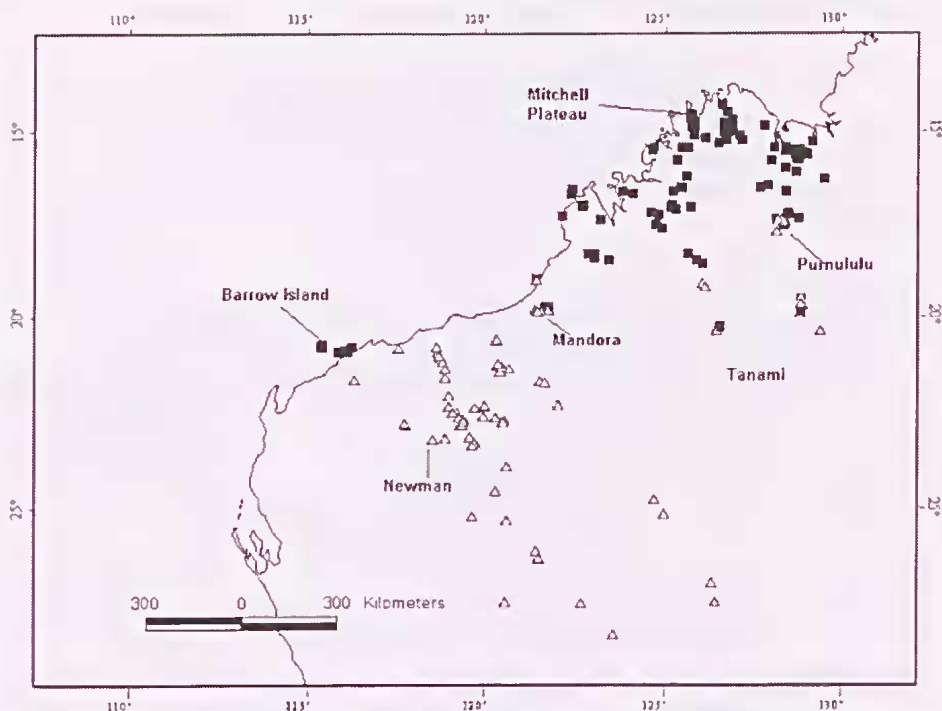


Figure 1. Distribution of *Pseudomys desertor* (open triangles) and *P. nanus* (dark squares), from specimen records in Western Australian Museum collections.

Table 1. Number, mean, minimum, maximum and standard deviation for male and female *Pseudomys nanus* and *P. desertor* measurements. Asterisks (after the measure) represent statistically significant differences between species for each sex; (*= <0.05 , **= <0.01 , ***= <0.001).

Variable	Nip1	Nip2	Test1	Testw	Ear	
<i>P. nanus</i>	♀	♀	♂	♂	♂	♀
Valid N	12	12	10	10	10	12
Mean	3.53 **	5.35 ***	16.20	9.98	10.32	9.50 *
Minimum	2.42	2.66	11.57	7.96	8.62	8.24
Maximum	4.88	8.07	22.68	12.37	11.94	11.56
Std. Dev.	0.89	1.50	3.54	1.60	0.93	0.92
<i>P. desertor</i>						
Valid N	13	13	9	9	10	13
Mean	5.53	9.43	11.45	8.45	8.77	8.48
Minimum	3.97	7.41	9.10	6.29	7.03	6.90
Maximum	6.46	12.11	16.53	9.73	9.70	9.52
Std. Dev.	0.83	1.54	2.49	1.22	0.80	0.79

nanus. Subadult and juvenile animals of both species may also be confused with another species, the widely distributed Sandy Inland Mouse, *P. hermannsburgensis*.

During recent surveys in the Pilbara and southern Kimberley regions, field biologists were sometimes unsure of the identity of *Pseudomys* trapped, as *P. nanus* and *P. desertor* are similar, and because *P. desertor* had rarely been trapped in Western Australia in recent times. In some areas both species have been trapped, e.g. at Mandora (19°47'31"S; 121°26'58"E), Tanami (19°53'S; 128°49'E), Great Sandy Desert (20°15'S; 126°34'E) and Purnululu (14°44'S; 128°09'E) (Figure 1). This paper was initiated to resolve identification problems in the field.

This work was made possible because of the collection of voucher specimens. These recent collections by environmental consultants and government

scientists highlight the value of Museum voucher specimens. Even experienced field biologists misidentify mammals, especially if the animals are immature or when little time is spent examining the animal; live mammals can be difficult to handle and cannot be retained for long. Voucher specimens allow a positive identification of some fauna species and better define their geographic range.

It is therefore of mutual benefit to the Western Australian Museum, government agencies and environmental companies to have representative specimens lodged at the Western Australian Museum. The collectors obtain positive identification of the fauna, the fauna data in environmental reports can be referred to with confidence and the reports can be updated during any future taxonomic revisions. Information on the distribution and seasonal

Pesl		Pesw		Hv		Tv	
♂	♀	♂	♀	♂	♀	♂	♀
10	12	10	12	10	12	10	12
22.64 *	20.72	4.12	3.52	91.95 *	79.68 *	60.44	92.18
21.23	19.83	3.32	2.60	81.00	70.76	0.00	81.46
23.99	22.13	4.69	3.98	103.46	89.71	121.79	100.74
0.89	0.73	0.45	0.41	6.04	6.39	52.92	6.00
10	13	10	13	10	13	10	13
20.66	20.08	3.70	3.61	75.99	73.51	73.48	87.85
19.83	18.64	3.28	2.61	71.46	62.12	0.00	71.58
21.54	22.19	4.22	4.42	80.66	81.10	92.37	96.71
0.59	0.95	0.33	0.42	3.03	5.91	26.51	6.38

reproductive status of species is available to the Western Australian Museum and therefore generally accessible to other research workers.

MATERIALS AND METHODS

A total of 22 specimens of *Pseudomys desertor* and 23 specimens of *P. nanus* from the mammal collection of the Western Australian Museum were measured and examined externally for differences between species (Table 1). Only adults, identified by sexual maturity, were used for these measurements. The specific identity of these animals was confirmed by cranial and dental characteristics. The following variables were measured: *nip1*, distance from anus to posterior nipple; *nip2*, distance from posterior nipple to anterior nipple; *testl*, length of testes; *testw*, width of both testes; *ear*, ear length; *pesl*, pes length; *pesw*, pes width at hallux; *hvl*, head-vent length; *tlv*, tail-vent length. Sexual dimorphism and

statistically significant differences between the two species for each variable were tested using analysis of variance, ANOVA, *Statistica* (Statsoft Inc., 1998). The weights of all specimens of both species listed on the Western Australian Museum mammal database are included in Table 2.

COMPARISON OF EXTERNAL CHARACTERS OF *PSEUDOMYS DESERTOR* AND *P. NANUS*

There are distinctive morphological differences between *P. nanus* and *P. desertor* based on cranial and dental characters, but these are not considered further in this paper as they cannot be used to distinguish living animals.

Both species have eye-rings and both have very similar patterns of pads on the pes (Figure 2a and 2b). The head of *Pseudomys desertor* appears more "mouse-like" and has a smaller eye than *P. nanus*, which has a typical "pseudomys" like face and a very distinctive large, bulbous eye (Figure 3a and 3b). The fur of *P.*

Table 2. Number, mean, minimum, maximum and standard deviation of weights (grams) of male and female *Pseudomys nanus*, *P. desertor* and *P. hermannsburgensis* from the Western Australian Museum mammal database.

	<i>P. nanus</i>		<i>P. desertor</i>		<i>P. hermannsburgensis</i>	
	♂	♀	♂	♀	♂	♀
Valid N	113	87	57	27	119	125
Mean	33.55	28.96	22.14	23.45	9.94	10.7
Minimum	15	15	15	15	4.3	5
Maximum	63	56	30	44	14.2	17.5
Std.Dev.	10.6	8.49	3.65	6.3	1.91	3.0



Figure 2a. Pes of *Pseudomys desertor* (M44055). Photo N. Cooper



Figure 2b. Pes of *Pseudomys nanus* (M56321). Photo R. Teale

desertor also has a “fluffier” or “spikier” appearance because of the prominent dark guard hairs (Figure 3a and 3b).

From an analysis of variance of all external characters, significant differences were found between *P. desertor* and *P.*



Figure 3a. *Pseudomys desertor* (M56322).

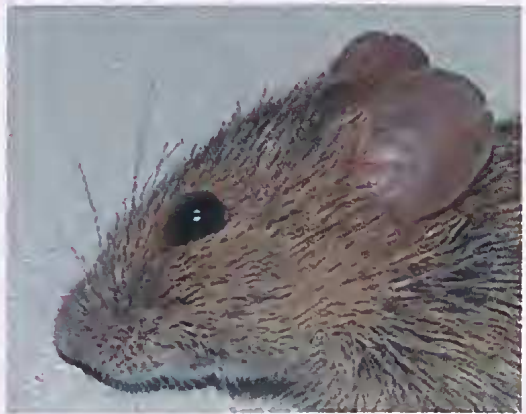


Figure 3b. *Pseudomys nanus* (M56321). Photos by R. Teale.

nanus. Males and females of each species are sexually dimorphic. Table 1 lists the number of individuals, the mean, minimum, maximum, standard deviation and an indication of statistically significant differences for each variable by species and sex.

Head and Ear

For both sexes together, *Pseudomys desertor* and *P. nanus* showed highly significant differences ($p < 0.001$) for *hv* and significant difference ($p < 0.05$) for *ear*. For males, the *hv* of *P. nanus* is significantly larger than that of *P. desertor*. For females, the *hv* and *ear* of *P. nanus* are significantly larger than those of *P. desertor* (Table 1).

The following live body weights were recorded from additional field caught, non-vouchered specimens of *Pseudomys desertor* in the Pilbara: September 2000; females, 6.5–31g (mean=21.2, $n=53$); males, 10.5–38g (mean=23, $n=66$); May 2000 in the Pilbara; females, 13.5–35g (mean=22, $n=20$); males, 11–30g (mean=21, $n=22$). Female *P. desertor* over 23g in weight usually had distended but not lactating nipples, and are considered to be adult. Similarly, males over 20g had distended or scrotal testes and are considered adult.

Body Weights

The following live body weights were recorded from vouchered specimens of *Pseudomys nanus* caught at the Mitchell Plateau, Kimberley, (Kitchener *et al.* 1981):

females, 25.5–39g (mean=33.6, $n=3$); males, excluding obvious juveniles, 25.5–46.5g (mean=33.9, $n=16$). *P. nanus* caught at the Drysdale River, Kimberley, (Western Australian Museum mammal database), adults only: females, 38g (mean=38, $n=1$); males, 30–50g (mean=40.3, $n=7$). The weights of all vouchered Western Australian Museum specimens of both species are listed in Table 2.

Female *P. desertor* vouchered in May 2000 from Meentheena, 200km NNE of Newman (Figure 1) were pregnant and female *P. nanus* vouchered in October 1976 from Mitchell Plateau, 700km NE of Mandora, were pregnant.

Nipples

Both species have two pairs of inguinal nipples. The position of the two pairs of nipples (Figure 4a and 4b) is diagnostic. In *Pseudomys desertor* the anterior pair of nipples lie about 1 cm from the middle of the femur, or about 60% of the distance between the anus and the distal end of the femur. Both *nip1* and *nip2* show significant differences between the two species (Table 1). In *P. nanus* the anterior pair of nipples is about 1.5cm from the anus or about 40% of the distance between the anus and the distal end of the femur.

Tails

The ratio of *head vent* / *tail vent* length between the two species is, females: 87: 84% and males: 93: 91% for *Pseudomys desertor* and *P.*



Figure 4a. Nipple arrangement of *Pseudomys desertor* (M48119). Photo N. Cooper



Figure 4b. Nipple arrangement of *Pseudomys nanus* (M50846). Photo N. Cooper

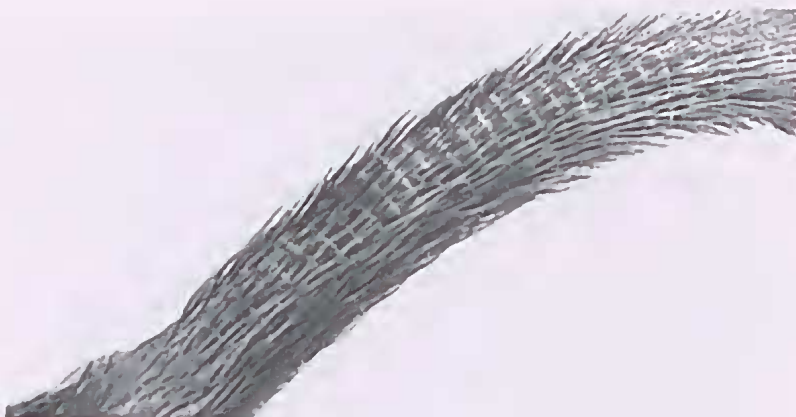


Figure 5a. Photo of the tail of *Pseudomys desertor*. Photo N. Cooper



Figure 5b. Photo of the tail of *Pseudomys nanus*. Photo N. Cooper

nanus respectively, there is no statistical difference in the ratio. The tail of *P. desertor* is hairier than *P. nanus* and not as strongly annulated as in *P. desertor* (Figures 5a and 5b). The tails of both species are bicoloured with the tail of *P. desertor* often very dark, nearly black on the dorsal surface.

Pelage

Pelage colour in both species is

very similar, but there is variation between localities. In general, the dorsal pelage of *P. desertor* has the distal 50% with bright orange, with a grey basal colouring and dark, prominent guard hairs. The ventral fur has fawn to cream tips, with a grey base. In *P. nanus*, the dorsal hairs are very similar to those of *P. desertor*, but the ventral fur usually has cream or white tips with a grey base, and so the pes

and thighs of *P. nanus* are paler than in *P. desertor*. Overall, the venter of *P. desertor* appears darker than that of *P. nanus* (Figures 4a and 4b). Both have an orange eye-ring and the eye of *P. nanus* is more prominent, giving a 'bug-eyed' appearance (Figures 3a and 3b).

Pes

For males, but not females, the pes length (*pesl*) of *P. nanus* is significantly larger than that of *P. desertor* (Table 1). The pattern of pads on the pes is very similar (Figures 2a and 2b). Annulations on the central digit of *P. desertor* range between 7 and 9; and those of *P. nanus* between 6 and 8. This is not a diagnostic character, due to the overlap in range of values between the two species. The skin on the pes of *P. desertor* is often very dark, nearly black whereas in *P. nanus* it is generally pale.

Behaviour

No major behavioural differences are apparent between *Pseudomys nanus* and *P. desertor* when handled, though *P. nanus* from islands appear to be more placid than those on the mainland. Both species are easier to handle than the House Mouse, *Mus musculus*. *P. desertor* is easy to remove from traps, though large males can be aggressive, and they are very vocal in collecting bags.

Pseudomys nanus emits a frequent high pitched whistling call when active (Watts 1981). *P. desertor*

makes mouse-like squeaks when handled.

Pseudomys desertor have been dug from shallow burrows and have been known to dig burrows in captivity. In dense vegetation, nests have been found in tussocks of Kangaroo Grass (Kerle 1998). *P. nanus* are known to build grass nests but it is not known whether they dig burrows (Robinson 1998).

Pseudomys desertor is known to exhibit diurnal behaviour. In November 1997 and in November 2000, *P. desertor* were caught actively moving about among spinifex clumps and in dense buffel grass in the early afternoon near the Nullagine River, at Meentheena, east Pilbara. In the Simpson desert, they are often seen in mid-late afternoon, throughout the year, moving between hummocks of spinifex (Chris Dickman *pers. comm.*).

Trap type

Pseudomys desertor and *P. nanus* have been trapped in both Elliott and pit traps. From the records in the Western Australian Museum Mammal database, it appears that both species have been trapped in all seasons.

COMPARISON OF *P. DESERTOR* AND *P. NANUS* WITH *P.* *HERMANNsburgensis*

In Western Australia, *Pseudomys desertor* adults (females, 23–44g; males, 22–30g), and *P. nanus*

adults (females, 9–56g; males, 34–63g) are much larger than the sympatric Sandy Inland Mouse, *P. hermannsburgensis* (females, 5–17.5g; males, 4.3–14.2g; Table 2, data from the Western Australian Museum mammal database). *P. desertor* is sympatric over much of its range with *P. hermannsburgensis*, and *P. nanus* may also be sympatric with it at the southern margin of its range. Both can be distinguished from *P. hermannsburgensis* by their larger size, darker pelage and distinctive eye-ring. The pes of both *P. desertor* and *P. nanus* are longer and broader (Table 1) than those of *P. hermannsburgensis* (pes length, mean=16.6mm; pes width, mean=2.8mm, Cooper 1993). The pattern of pads on the pes of *P. desertor* and *P. nanus* (Figure 2a and 2b) are almost identical, while both are quite different from *P. hermannsburgensis* (Cooper 1993).

Pseudomys desertor and *P. nanus* are herbivorous (though Murray *et al.* 1999, found in the Simpson Desert that *P. desertor* was granivorous), while *P. hermannsburgensis* is mainly granivorous though it has been found to be omnivorous (Watts and Aslin 1981). All three species experience population fluctuations, but that of the vegetation dependant species occur at different times to that of the mainly seed-eating *P. hermannsburgensis*. *P. desertor* responds to effective rainfall events more slowly than granivores (Reid *et al.* 1992). *P.*

desertor is more fecund than *P. hermannsburgensis*, as measured by the bigger litter and the shorter length of gestation, weaning period and age to sexual maturity (Yom-Tov 1985).

CONCLUSIONS

Pseudomys desertor and *P. nanus* have a very similar external appearance. Adults can be distinguished by the relative position of the nipples in the female, by the shape of the head (more pointed in the former and more square in the latter), by a distinctive bulbous eye in *P. nanus*, and by overall size (*P. desertor* is smaller than *P. nanus*). These differences are described in detail in the section dealing with comparison of external characters above. The juveniles of the two species can be distinguished from the partially sympatric *P. hermannsburgensis* by the presence of an eye-ring, overall darker pelage and larger size.

ACKNOWLEDGEMENTS

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